As we are using a reflective pyramid compounding structure, the contracts we will close at each profit target will follow the same equation:

$$42 = x + 2x + 4x$$

If we solve this equation, x = 6, so we will close 6 contracts if the price drops below $85, and we will close out 12 contracts if the price breaks down the 20-week support level ($55).

8C. Based on the pattern of a reflective pyramid, how many contracts will you close out if the price drops to 75? (4 points)

6 contracts.

8D. How many more contracts will you close out if the price drops to 62? (3 points)

None.

8E. How many more contracts will you close out if the price drops to 52? (3 points)

12 contracts.

2. PRACTICE EXAM II.

Section	Number of Questions	Topics Covered	Points in Section
1	6	Ethics	6
2	3 – 10	Each of the exam questions will consist of an integrated mix of two or three knowledge domains from among those specified on the mta.org website: Risk Management, Asset Relationships, Portfolio Management, Classical Methods, Behavioral Finance, Volatility Analysis.	20 – 40
3	3 – 10		20 – 40
4	3 – 10		20 – 40
5	3 – 10		20 – 40
6	3 – 10		20 – 40
7	3 – 10		20 – 40
8	3 – 10		20 – 40

- This is a sample exam. Questions here are indicative of the style you will encounter when taking the Level III examination, but they are not a comprehensive review of all topics that will be tested on.
- Not all topics in the reading list will appear on a given test. This sample exam attempts to demonstrate one possible scenario. Any resemblance to actual test questions is neither implied nor intended.
- The scoring on the sample is shown as variable to demonstrate that actual exam sections may vary in their point count. Individual point counts are placed within questions to provide an indication of how various questions may be valued. In general, the rule of guidance is that one point will equal one minute of time spent. Though this will vary from one question to the next, it is a general guideline to follow for study and time management purposes during the exam.

2.1. Section 1. Ethics (12 points).

1A. David Johnson, a senior analyst with a brokerage firm, decides to change his recommendation for the common stock of Pigeon Industries, Inc. from a "buy" to a "sell". This change in investment advice is mailed to all the firm's clients on Wednesday. Next day, a client calls in with a buy order for 500 shares of Pigeon Industries, Inc. In this circumstance, Johnson should: (2 points)

a) Accept the order.
b) Advise the customer of the change in recommendation after accepting the order.
c) Advise the customer of the change in recommendation before accepting the order.
d) Not accept the order because it is contrary to the firm's recommendation.

1B. The mosaic theory holds that an analyst: (2 points)

a) Violates the Code and Standards if the analyst fails to have knowledge of and comply with the applicable laws.
b) Can use material public information and nonmaterial nonpublic information in the analyst's analysis.
c) Should use all available and relevant information in support of an investment recommendation.
d) Can use material and nonmaterial nonpublic information in the analyst's analysis.

1C. Bell is a portfolio manager. One of his firm's clients has told Bell that he will compensate him beyond the compensation provided by his firm on the basis of the capital appreciation of his portfolio each year. Bell should: (2 points)

a) Accept the arrangement before obtaining permission from his employer.
b) Obtain permission from his employer prior to accepting the compensation arrangement.
c) Turn down the additional compensation because it will create undue pressure on him to achieve strong short-term performance.
d) Turn down the additional compensation because it will result in conflicts with the interests of other client's accounts.

1D. Which of the following is a correct statement of a member's or candidate's duty under the Code and Standards? (2 points)

a) In the absence of specific applicable law or other regulatory requirements, the Code and Standards govern the member's or candidate's actions.
b) A member or candidate is required to comply only with applicable local laws, rules, regulations, or customs, even though the Code and Standards may impose a higher degree of responsibility or a higher duty on the member or candidate.
c) A member or candidate who trades securities in a market where no applicable laws or stock exchange rules regulate the use of material nonpublic information may take investment action based on material nonpublic information.
d) A member or candidate who trades securities in a market where stock exchange rules permit the use of material nonpublic information may take investment action based on material nonpublic information after obtaining prior approval from his/her supervisor.

1E. Elizabeth is a financial analyst with XYZ Brokerage Firm. She is preparing a purchase recommendation on JNI Corporation. Which of the following situations is most likely to represent a conflict of interest for Elizabeth that would have to be disclosed? (2 points)

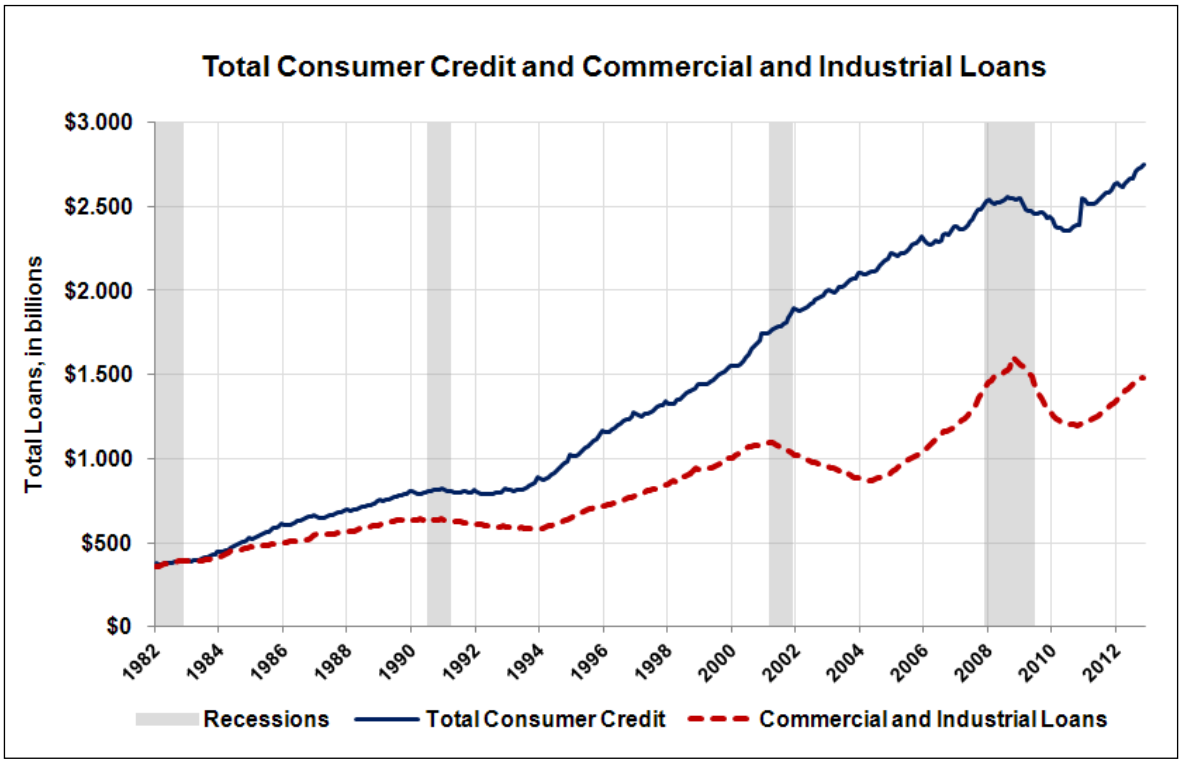
a) Elizabeth's brother-in-law is a supplier to JNI.
b) Elizabeth frequently purchases items produced by JNI.
c) XYZ holds for its own account a substantial common stock position in JNI.
d) Elizabeth's experience with purchasing items produced by JNI has been extremely positive.

1F. Which of the following is not a category listed among the standards of professionalism in the CFA Standards of Professional Conduct? (2 points)

a) Knowledge of the Law
b) Independence and Objectivity
c) Misconduct
d) Fairness.

2.2. Section 2 (20 - 40 points).

You are a macro and momentum fund manager for *Omega Investment Partners,* and you are in charge of 3 funds (Alpha, Beta and Gamma) focused on the U.S. markets from a long-term perspective. In order to achieve your conclusions you have gathered the following charts: Figure 2-1 shows the total commercial and industrial loans along with the total consumer credit for the U.S. economy from 1982 to 2012. Figure 2-2 illustrates a monthly bar chart or the S&P 500 from 2000 to 2015 along with a 21-monthly exponential moving average. Table 2-1 illustrates the performance of all these funds.



Source: Federal Reserve Economic Database. Figure 2-1

Source: www.stockcharts.com. Figure 2-2

	Fund Alpha	Fund Beta	Fund Gamma
Percent profitable	30.5%	56.6%	59.4%
10-year average annual return	15.7%	8.2%	9.3%
Standard deviation of annual returns	20.8%	12.6%	13.9%
Average beta of stocks in fund	1.4	-0.54	1.1
Covariance with the S&P-500 index	23513	-51524	15101
Correlation coefficient with the S&P-500 index	0.58	-0.12	0.45
Sharpe Ratio	0.65	0.75	0.46
Max DrawDown (MaxDD)	29.8%	19.9%	22.7%
Information ratio based on 10-year average return	1.81	0.82	1.16

Source: Own Elaboration. Table 2-1

2A. Figure 2-1 shows the total commercial and industrial loans along with the total consumer credit for the U.S. economy from 1982 to 2012. Determine whether this economic indicator is leading, coincident, or lagging. Explain how to use it, and illustrate, briefly, the implications for the U.S. economy. (8 points)

2B. Figure 2-2Figure 2-2 illustrates a monthly bar chart or the S&P 500 from 2000 to 2015 along with a 21-monthly exponential moving average. Determine a basic recommendation about the timeframe used in this chart. (8 points)

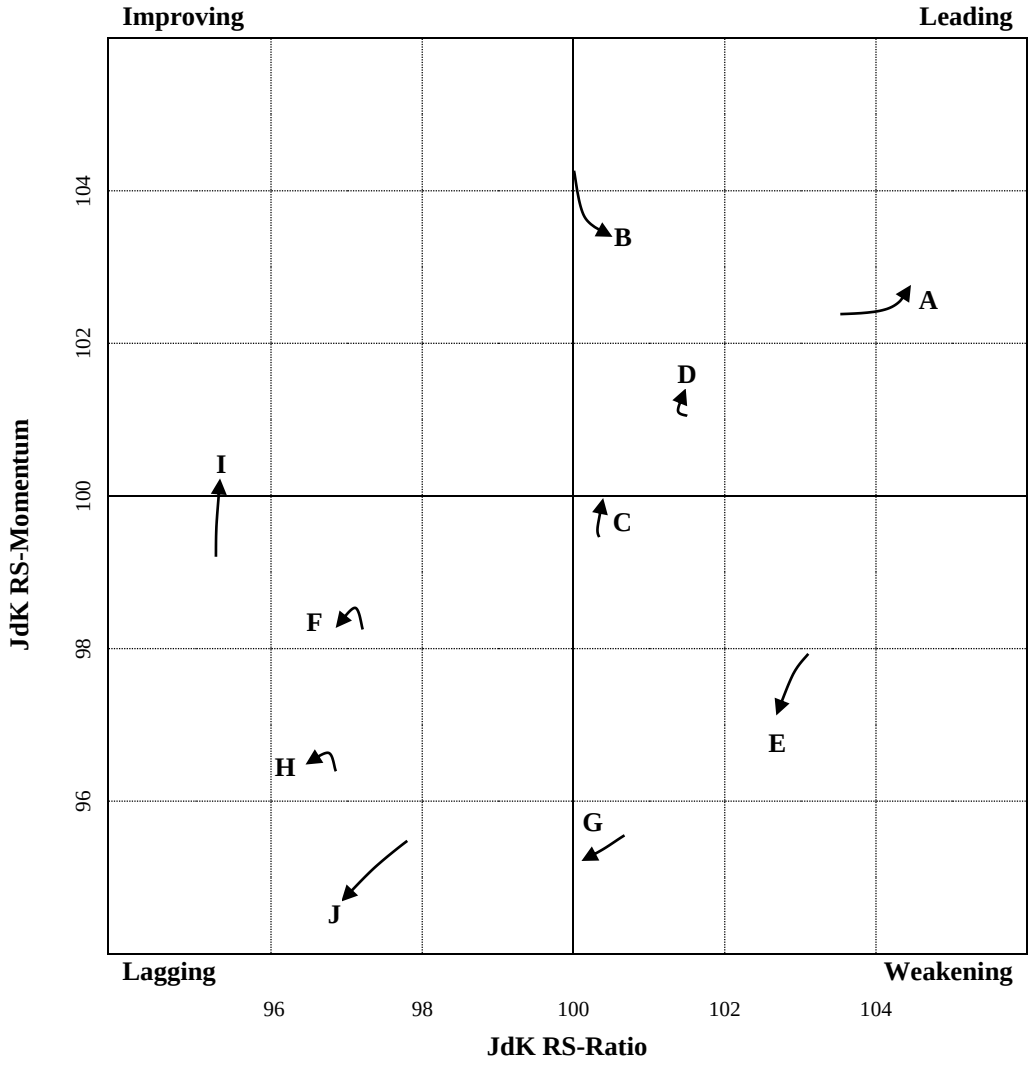
2C. Figure 2-2 illustrates a monthly bar chart or the S&P 500 from 2000 to 2015 along with a 21-monthly exponential moving average. Determine the long-term trend of this equity index. Base your analysis in the technical indicator. (8 points)

2D. According to Table 2-1 determine which fund has a higher total risk. (7 points)

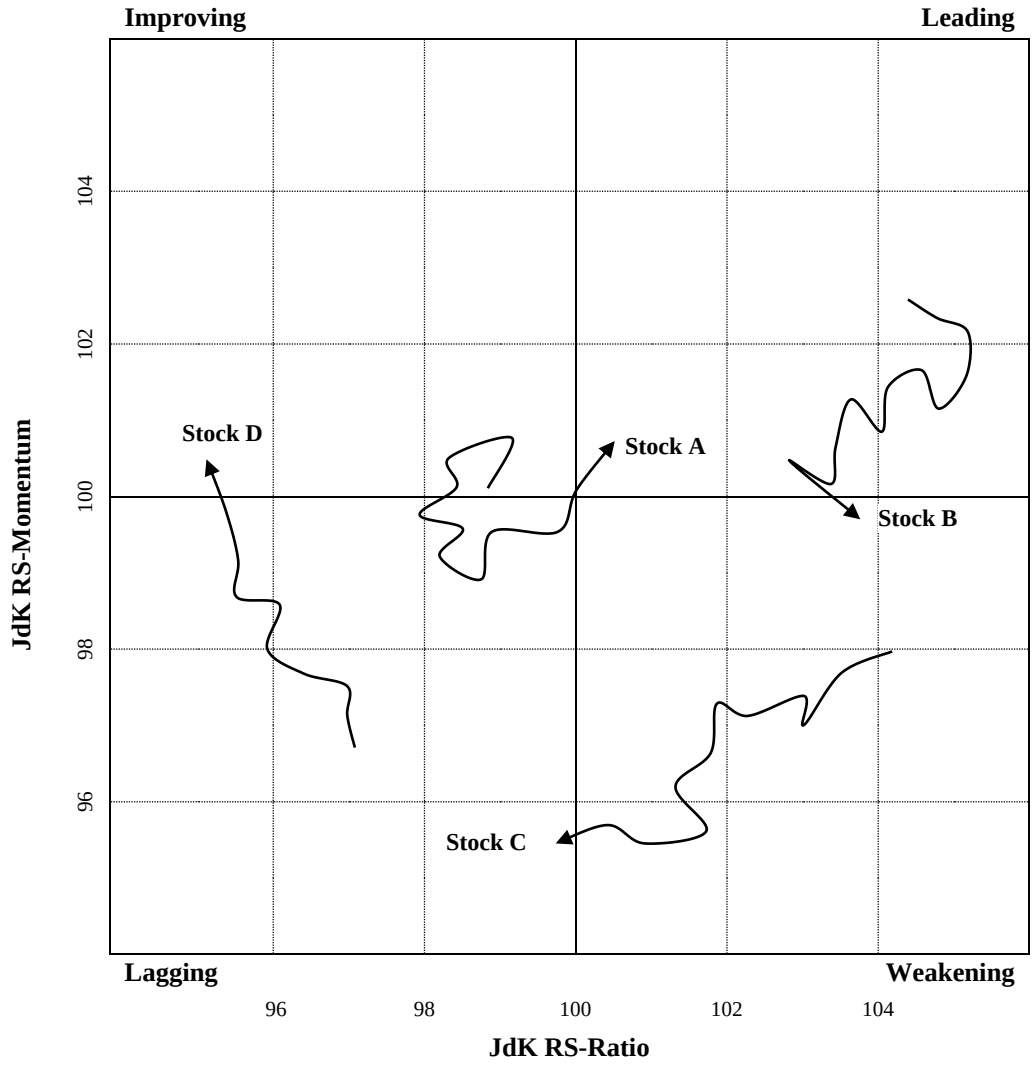
2E. According to Table 2-1 determine which fund has a higher systematic risk. (7 points)

2.3. Section 3 (20 - 40 points).

You are a hedge fund manager working for a money management firm and you are responsible for four hedge funds (Alpha, Beta, Gamma, and Delta). All four funds invest in equity taking both long and short positions. In a meeting with potential clients you show them the main characteristics of these investment vehicles. Figure 2-3 illustrates a relative rotational graph showing the main ten sectors of the securities' universe included in your investment vehicles with a short trailing period of 3 weeks. Figure 2-4 illustrates a relative rotational graph of four stocks (A, B, C, and D) that are potential candidates for hedge fund Gamma with a long trailing period of 14 weeks. Table 2-2 illustrates the comparison between the portfolio of stocks included in hedge fund Delta and their benchmark (SPDR ETFs).



Source: Own Elaboration. Figure 2-3



Source: Own Elaboration. Figure 2-4

Sector	Sector Return	Weighted Sector Return	Portfolio Return	Weighted Port. Return	Higher/Lower Return
Healthcare	10.50%	1.61%	11.00%	1.68%	0.08%
Telecommunication Services	17.50%	0.88%	10.40%	0.52%	-0.36%
Industrials	5.00%	0.82%	54.00%	8.80%	7.99%
Utilities	7.52%	0.65%	36.00%	3.13%	2.48%
Information Technology	5.50%	1.10%	-25.40%	-5.08%	-6.18%
Energy	10.00%	0.54%	9.00%	0.49%	-0.05%
Consumer Staples	15.40%	2.37%	20.80%	3.20%	0.83%
Consumer Discretionary	5.00%	0.33%	-14.60%	-0.95%	-1.27%
Materials	4.01%	0.02%	16.00%	0.06%	0.05%
Financials	14.00%	0.98%	6.00%	0.42%	-0.56%
$\sum$		**9.28%**		**12.28%**	**3.00%**
$\bar{x}$	**9.44%**		**12.32%**		

Source: Robert Weigand Table 2-2

3A. A relative rotational graph (RRG) is a scatter diagram used to see the situation and evolution of different sectors, stocks, currencies, funds, etc. Paul Ciana created these charts and he uses two proprietary indicators, a relative strength momentum, and a relative strength ratio to classify sectors into four quadrants (weakening, lagging, improving, and leading). In Figure 2-3 the ten sectors are classified according to this type of graph. Determine the correct sentence. (4 points)

a) Sector A is in the top-right quadrant. Elements in this quadrant have positive relative strength and positive momentum, which means that the RS is still getting stronger.
b) Sector E is in the bottom-right quadrant. Elements in this quadrant have positive relative strength and positive momentum, which means that the RS is still getting stronger.
c) Sector H is in the bottom-left quadrant. Elements in this quadrant have positive relative strength and positive momentum, which means that the RS is still getting stronger.
d) Sector I is in the top-left quadrant. Elements in this quadrant have positive relative strength and positive momentum, which means that the RS is still getting stronger.

3B. Determine the better candidates for a long or an overweight position from the ten sectors illustrated in Figure 2-3. (11 points)

3C. Determine the best candidate for a long position in hedge fund Gamma from the four stocks illustrated in Figure 2-4. (9 points)

3D. Taking the performance attribution study illustrated in Table 2-2, determine the portfolio weights of Energy and Industrials. (8 points)

3E. Taking the performance attribution study illustrated in Table 2-2,Table 2-2 determine whether the sector allocation and the stock picking strategies for hedge fund Delta are positive or negative, and explain your answer. (8 points)

2.4. Section 4 (20 - 40 points).

You are the head of a department in charge of managing mutual and hedge funds for Lahkswred Investment Partners. Your company has hired 10 fund manager trainees and you are going to spend 2 weeks training them about the company culture and the management methods employ in your department. During this 2-week training program some relevant questions arise about momentum myths and behavioral finance.

4A. One of the trainees usually refers to trading methods that neglect small risk, ignoring all risks positioned between the extremes. You know that most people have a tendency to overstate the probability of events in which they have a large bank of relevant memories, and you tell your trainees that this bias is known as the: (6 points)

a) Representativeness bias.
b) Conjunction fallacy.
c) Small sample bias.
d) Probability neglect bias.

4B. When you explain in detail the momentum strategies used by your firm to manage some of the mutual funds, one of the trainees asks why you are using momentum strategies on the long side if this kind of strategies can only be exploited on the short side. Is this commentary correct? (14 points)

4C. When you explain in detail how your department manages these funds, you mention that in the morning investment committee all fund managers use a brainstorming process to decide the main action for the rest of the day. However, you warn your trainees that this kind of groups, in order to be an efficient device must meet three relevant conditions. Could you name, at least, two of these three conditions? (14 points)

2.5. Section 5 (20 - 40 points).

You work as a hedge fund manager for a big investment company and you are responsible for three hedge funds: hedge fund ALPHA, which is based on a long-only strategy based on U.S. and European stocks; hedge fund BETA, which is based on a long-only strategy based on European fixed-income securities. No leverage is allowed in this fund; and hedge fund GAMMA, which is mainly invested in commodity futures and it benefits from leverage and from long and short positions. You are studying the time series of Bank of America in order to add this security to one of your hedge funds. You have gathered the following information: Figure 2-5 illustrates in the upper window the ratio between BAK and the S&P-500 index in a line format from June 2012 to October 2015. In the lower window, the same period and format illustrates the S&P-500 index alone. Table 2-3 shows a 10-year correlation matrix between the daily returns of Bank of America, some funds and some indices. Figure 2-6 represents the characteristic line between the S&P-500 index and Bank of America stock price.

Source: StockCharts.com. Figure 2-5

5A. Taking the information contained in Figure 2-5 and the relative strength theory, what would have been the result of a long position in BAK during this period (June 2012 to October 2015)? (7 points)

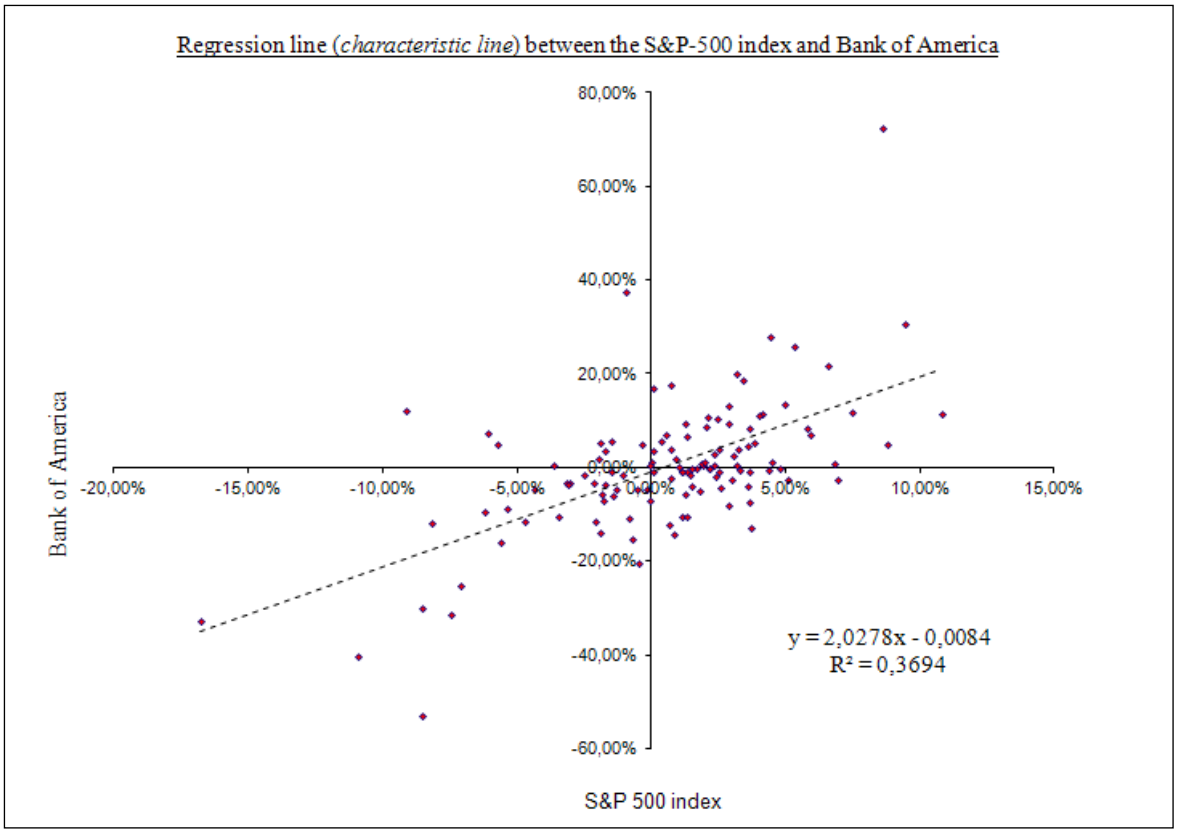
5B. Taking the information contained in Figure 2-5, determine a clear trading signal that has just been triggered in the stock time series according to traditional charting methods. (8 points)

	BAK	HF Alpha	HF Beta	HF Gamma	S&P-500	Bond Index
BAK	1.00	0.50	0.18	-0.43	0.30	0.10
HF Alpha		1.00	0.32	-0.41	0.68	0.43
HF Beta			1.00	-0.16	0.23	0.73
HF Gamma				1.00	-0.57	-0.17
S&P-500					1.00	0.21
Bond Index						1.00

Source: Own Elaboration Table 2-3

5C. You are analyzing Bank of America and you are interested in a security which performs as a return enhancer and not as a risk reducer. Taking the information contained in Table 2-3 determine in which fund will you include this stock. (7 points)

5D. If one of your clients is interested in taking a position in two of your hedge funds, which combination is better in order to reduce the risk of the portfolio? Take the information contained in Table 2-3. (8 points)



Source: Excel. Figure 2-6

5E. Taking the information illustrated in Figure 2-6, determine the systematic risk of Bank of America and interpret this result. (6 points)

5F. Taking the information illustrated in Figure 2-6, determine how well data fit into this statistical regression line. (4 points)

2.6. Section 6 (20 - 40 points).

You are a quantitative trader working for a CTA. You have just finished three quantitative trading strategies based on technical analysis indicators (e.g., moving averages, MACD, RSI, Stochastic, etc.). In Table 2-4 you have gathered all the relevant information related to these trading strategies. This backtest is the result of applying these strategies to a 10-year daily S&P-500 futures time series, using just one electronic contract.

	Strategy River	Strategy Glacier	Strategy Ocean
Percent profitable	35.22%	56.71%	71.22%
Net Profits	$104,690	$81,147	$51,471
Annualized returns	16.7%	6.2%	5.3%
Annualized standard deviation of returns	19.7%	11.6%	13.9%
RFR	2%	2%	2%
Total Gross Profits	$898,474	$447,456	$325,124
Total Gross Losses	$789,784	$347,544	$257,234
Total trades	142	328	556
Max DrawDown (MaxDD)	29.8%	16.9%	22.7%
MaxDD in $			
Time in the market	99%	60%	19.35%
Beta	0.98	0.15	0.54
RFR	2%	2%	2%

Source: Own Elaboration. Table 2-4

6A. In a meeting with the head of the quantitative trading department of your company, you are asked about what types of objective functions did you use in order to optimize and classify the different tests. ¿Could you give the three test functions defined by Perry Kaufman to create a robust trading strategy? (12 points)

6B. Once you show these results to the head of the quantitative trading department, you realize that you forgot to include the Sharpe ratio. Could you determine this relevant ratio for all three strategies? (11 points)

6C. When the head of the head of the quantitative trading department ask you why you did not include the Sharpe ratio in your backtest, you tell him that Sharpe ratio has two severe problems when applied to trading strategies backtests. Could you illustrate both drawbacks? (13 points)

2.7. Section 7 (20 - 40 points).

Ben Craft, a research analyst at your firm, has asked you to review a candlestick chart he plans to use in a market newsletter. Ben highlighted three sections of the chart, labeled A, B, & C (shown in Figure 2-7). Examine each of the highlighted candlestick patterns to answer the questions that follow.

Source: www.cmtassociation.org. Figure 2-7

7A. Is the name Ben gave for A correct? Answer "yes" or "no." If you answer "no," provide the correct pattern name. Also explain whether the short-term price action that followed the highlighted pattern matches the standard forecast for the pattern based on its correct name. (4 points).

7B. Is the name Ben gave for B correct? Answer "yes" or "no." If you answer "no," provide the correct pattern name. Also explain whether the short-term price action that followed the highlighted pattern matches the standard forecast for the pattern based on its correct name. (4 points).

7C. Is the name Ben gave for C correct? Answer "yes" or "no." If you answer "no," provide the correct pattern name. Also explain whether the short-term price action that followed the highlighted pattern matches the standard forecast for the pattern based on its correct name. (4 points).

Source: www.cmtassociation.org. Figure 2-8

7D. An analyst in your company is ready to place a buy recommendation on the security shown in Figure 2-8, with the recommendation that it be accumulated beginning at the open of the next day's trading session. Explain the evidence you see on this chart that would suggest this decision may not reflect the best timing. (8 points).

Source: www.cmtassociation.org. Figure 2-9

7E. Your portfolio manager wants an e-mail from you with an explanation of your analysis for Figure 2-9. Write the body of that e-mail in ten sentences or less and include the following information: name and implication of the most recent candlestick pattern; explanation of the weight of evidence from the chart including any other indications besides candlestick patterns; name and discuss the implication of 3 prior multiple-bar candle patterns that support your conclusion. (7 points).

Source: www.cmtassociation.org. Figure 2-10

7F. What is your short-term recommendation for the security in Figure 2-10? Discuss more than one multi-bar candlestick pattern (name, approximate date, and implication) that supports your conclusion. In your analysis, include your interpretation of the provided technical indicators: Parabolic SAR, 20-day Exponential Moving Average (EMA), and Relative Strength Index (RSI). (7 points).

7G. Based on your answer to the previous question, describe how you would setup a trade based on that information: (6 points)

If you described a long entry in the previous question, then assume an entry at $74.21. Specify the proper stop-loss price based on the most recent PSAR pattern – also calculate the number of shares that should be purchased, if the position needs to have no more than $20000 at risk when it stopped out (assuming you are able to get out of the position at your stop price).

If you described a short entry in the previous question, then assume an entry at $73.25. Specify the proper stop-loss price based on the most recent candle pattern - again, also calculate the number of shares that should be purchased, if the position needs to have no more than $20000 at risk when it stopped out (assuming you are able to get out of the position at your stop price).

2.8. Answers for Practice Exam II.

1A. David Johnson, a senior analyst with a brokerage firm, decides to change his recommendation for the common stock of Pigeon Industries, Inc. from a "buy" to a "sell". This change in investment advice is mailed to all the firm's clients on Wednesday. Next day, a client calls in with a buy order for 500 shares of Pigeon Industries, Inc. In this circumstance, Johnson should: (2 points)

c) Advise the customer of the change in recommendation before accepting the order.

This question involves Standard III (B) – Fair Dealing. *Reference: Code of Ethics and Standards of Professional Conduct.*

1B. The mosaic theory holds that an analyst: (2 points)

b) Can use material public information and nonmaterial nonpublic information in the analyst's analysis.

This question involves Standard II (A) – Material Nonpublic Information. Reference: Code of Ethics and Standards of Professional Conduct.

1C. Bell is a portfolio manager. One of his firm's clients has told Bell that he will compensate him beyond the compensation provided by his firm on the basis of the capital appreciation of his portfolio each year. Bell should: (2 points)

b) Obtain permission from his employer prior to accepting the compensation arrangement.

Obtain permission from his employer prior to accepting the compensation arrangement. This question involves Standard IV (B) – Additional Compensation Arrangements. Reference: Code of Ethics and Standards of Professional Conduct.

1D. Which of the following is a correct statement of a member's or candidate's duty under the Code and Standards? (2 points)

a) In the absence of specific applicable law or other regulatory requirements, the Code and Standards govern the member's or candidate's actions.

In the absence of specific applicable law or other regulatory requirements, the Code and Standards govern the member's or candidate's actions. This question involves Standard I (A) – Material Nonpublic Information. Reference: Code of Ethics and Standards of Professional Conduct.

1E. Elizabeth is a financial analyst with XYZ Brokerage Firm. She is preparing a purchase recommendation on JNI Corporation. Which of the following situations is most likely to represent a conflict of interest for Elizabeth that would have to be disclosed? (2 points)

a) Elizabeth's brother-in-law is a supplier to JNI.

This question involves Standard VI (A) – Disclosure of Conflicts. Reference: Code of Ethics and Standards of Professional Conduct.

1F. Which of the following is not a category listed among the standards of professionalism in the CFA Standards of Professional Conduct? (2 points)

d) Fairness.

I. Professionalism.

A. Knowledge of the Law.
B. Independence and Objectivity.
C. Misrepresentation.
D. Misconduct.

II. Integrity of Capital Markets.

A. Material Nonpublic Information.
B. Market Manipulation.

III. Duties to Clients.

A. Loyalty, Prudence, and Care.
B. Fair Dealing.
C. Suitability.
D. Performance Presentation.
E. Preservation of Confidentiality.

IV. Duties to Employers.

A. Loyalty.
B. Additional Compensation Arrangements.
C. Responsibilities of Supervisors.

V. Investment Analysis, Recommendations, and Actions.

A. Diligence and Reasonable Basis.
B. Communication with Clients and Prospective Clients.
C. Record Retention.

VI. Conflicts of Interests.

A. Disclosure of Conflicts.
B. Priority of Transactions.
C. Referral Fees.

2A. Figure 2-1 shows the total commercial and industrial loans along with the total consumer credit for the U.S. economy from 1982 to 2012. Determine whether this economic indicator is leading, coincident, or lagging. Explain how to use it, and illustrate, briefly, the implications for the U.S. economy. (8 points)

The total figure of commercial and industrial loans is considered as a lagging economic indicator. Total business loans are expected to peak after an expansion because declining profits trigger the need for borrowed funds. Troughs usually take place a year or more after a recession ends. In our chart, both time series are positive for the U.S. economy and they indicate the U.S. economy is in an expansionary phase.

2B. Figure 2-2 illustrates a monthly bar chart or the S&P 500 from 2000 to 2015 along with a 21-monthly exponential moving average. Determine a basic recommendation about the timeframe used in this chart. (8 points)

Because this chart includes more than 15 years of data (from the beginning of 2000 to the mid of 2015) it will be more efficient if this would be shown in a semi-logarithm scale, instead of an arithmetic scale.

2C. Figure 2-2 illustrates a monthly bar chart or the S&P 500 from 2000 to 2015 along with a 21-monthly exponential moving average. Determine the long-term trend of this equity index. Base your analysis in the technical indicator. (8 points)

It is clear from this chart that an excellent bull trend started on 2009, and this trend has been in the market for more than 6 years. If we base our analysis in the EMA, the bull trend is still active, because the closing price of the current bar is above this trend-following indicator, although it is now using the EMA as a support level.

2D. According to Table 2-1 determine which fund has a higher total risk. (7 points)

Total risk is measured by the standard deviation of returns. Therefore, in our example, the riskiest fund from a total risk perspective is “Alpha”.

Total Risk	=	Market or Macroeconomic Risk	+	Firm-Specific Risk
Total Risk	=	Systematic Risk	+	Unsystematic Risk
Total Risk	=	Undiversifiable Risk	+	Diversifiable Risk

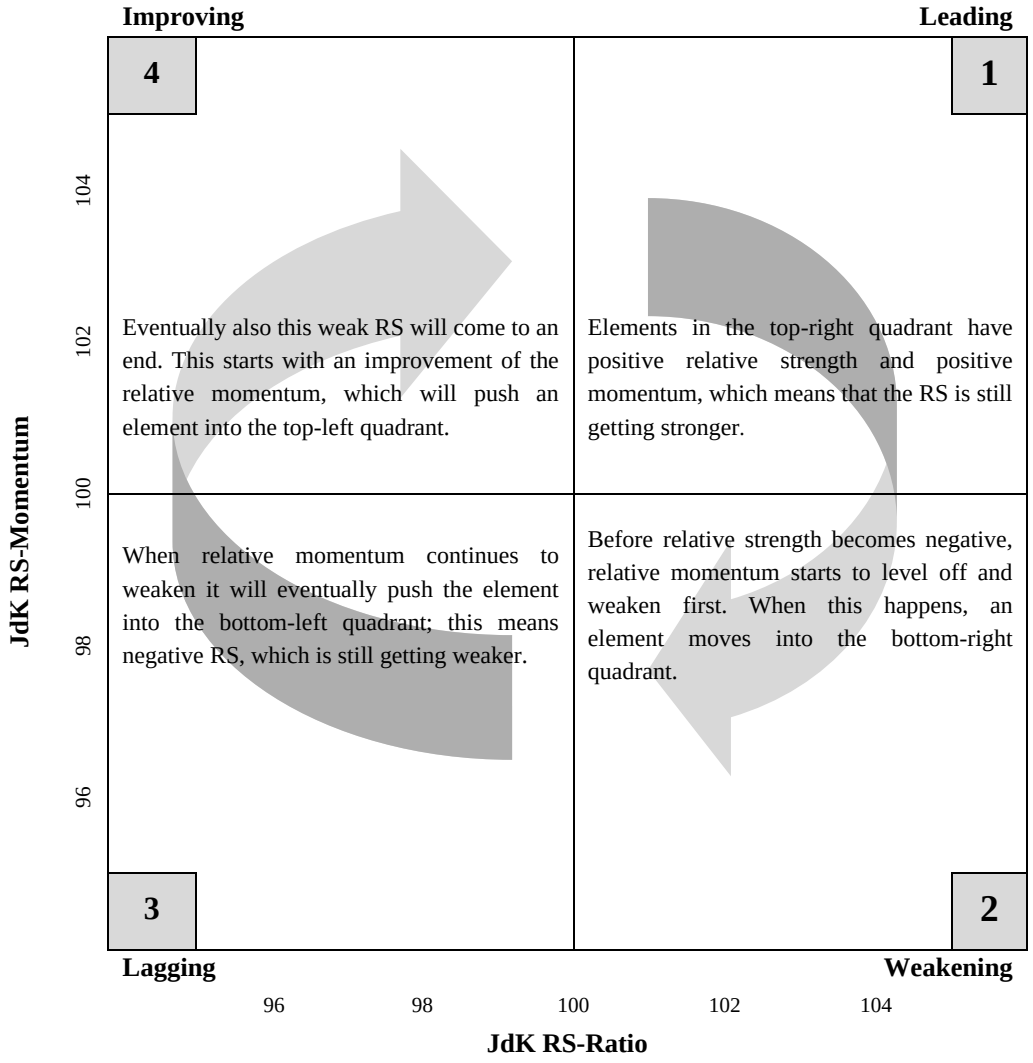
2E. According to Table 2-1 determine which fund has a higher systematic risk. (7 points)

Systematic risk is measured by the beta coefficient of the stocks included in the fund. Therefore, in our example, the riskiest fund from a systematic risk perspective is "Alpha".

Total Risk	=	Market or Macroeconomic Risk	+	Firm-Specific Risk
Total Risk	=	Systematic Risk	+	Unsystematic Risk
Total Risk	=	Undiversifiable Risk	+	Diversifiable Risk

3A. A relative rotational graph (RRG) is a scatter diagram used to see the situation and evolution of different sectors, stocks, currencies, funds, etc. Paul Ciana created these charts and he uses two proprietary indicators, a relative strength momentum, and a relative strength ratio to classify sectors into four quadrants (weakening, lagging, improving, and leading). In Figure 2-3 the ten sectors are classified according to this type of graph. Determine the correct sentence. (4 points)

a) Sector A is in the top-right quadrant. Elements in this quadrant have positive relative strength and positive momentum, which means that the RS is still getting stronger.



Source: Paul Ciana Figure 2-11

3B. Determine the better candidates for a long or an overweight position from the ten sectors illustrated in Figure 2-3. (11 points)

From all these ten sectors, A is the leading one and B has just entered the top-right quadrant and looks likely to continue higher on the JdK RS-Ratio scale, so both sectors are candidates for a long position or an overweight.

3C. Determine the best candidate for a long position in hedge fund Gamma from the four stocks illustrated in Figure 2-4. (9 points)

Stock A. Using an RRG we can take a long position in those elements that are crossing into or have just crossed into the top-right quadrant and go short on those that have crossed or are crossing into the bottom-left quadrant.

3D. Taking the performance attribution study illustrated in Table 2-2, determine the portfolio weights of Energy and Industrials. (8 points)

$$\text{Weighted Portfolio Return}_i = \text{Portfolio Weight}_i \cdot \text{Portfolio Return}_i$$

$$\text{Portfolio Weight}_i = \frac{\text{Weighted Portfolio Return}_i}{\text{Portfolio Return}_i}$$

$$\text{Portfolio Weight}_{\text{Energy}} = \frac{\text{Weighted Portfolio Return}_{\text{Energy}}}{\text{Portfolio Return}_{\text{Energy}}} = \frac{0.49\%}{9.00\%} = 5.44\%$$

$$\text{Portfolio Weight}_{\text{Industrials}} = \frac{\text{Weighted Portfolio Return}_{\text{Industrials}}}{\text{Portfolio Return}_{\text{Industrials}}} = \frac{8.80\%}{54.00\%} = 16.30\%$$

3E. Taking the performance attribution study illustrated in Table 2-2, determine whether the sector allocation and the stock picking strategies for hedge fund Delta are positive or negative, and explain your answer. (8 points)

As we can see in Table 2-2, the hedge fund Delta stock-picking process worked for half of the sectors: healthcare, industrials, utilities, consumer staples, and materials, but it did not work for the other half: telecommunication services, information technology, energy, customer discretionary, and financials. Take into account that the 3% of higher return has nothing to do with the sector allocation, that is, with our strategy in term of over or under weighting each sector. This excess return is the result of our active management or stock picking strategy, so we cannot give any conclusions about the sector allocation process.

4A. One of the trainees usually refers to trading methods that neglect small risk, ignoring all risks positioned between the extremes. You know that most people have a tendency to overstate the probability of events in which they have a large bank of relevant memories, and you tell your trainees that this bias is known as the: (6 points)

d) Probability neglect bias.

The neglect of probability, a type of cognitive bias, is the tendency to completely disregard probability when making a decision under uncertainty and is one simple way in which people regularly violate the normative rules for decision making. Small risks are typically either neglected entirely or hugely overrated; the continuum between the extremes is ignored. The term probability neglect was coined by Cass Sunstein. Most people have a tendency to overstate the probability of events in which they have a large bank of relevant memories. For example, when asked "what cause more deaths – tornadoes or asthma? Most people think that tornadoes kill more people than asthma. However, asthma is 20 times as deadly.

4B. When you explain in detail the momentum strategies used by your firm to manage some of the mutual funds, one of the trainees asks why you are using momentum strategies on the long side if this kind of strategies can only be exploited on the short side. Is this commentary correct? (14 points)

Clifford Asness, Andrea Frazzini, Ronen Israel, and Tobias Moskowitz show ten myths about momentum investing and refute them, according to the simplest best publicly available data, and according to conclusions extracted from academic papers.

One of these myths is based on the idea that momentum cannot be captured by long-only investors. The defenders of this myth consider that returns coming from momentum are the result of shorting the losers and the UMD (up minus low) factor is long winners and short losers. As these authors explained in their reading assignment this perception is totally wrong, and momentum does not work better, or only, on the short side.

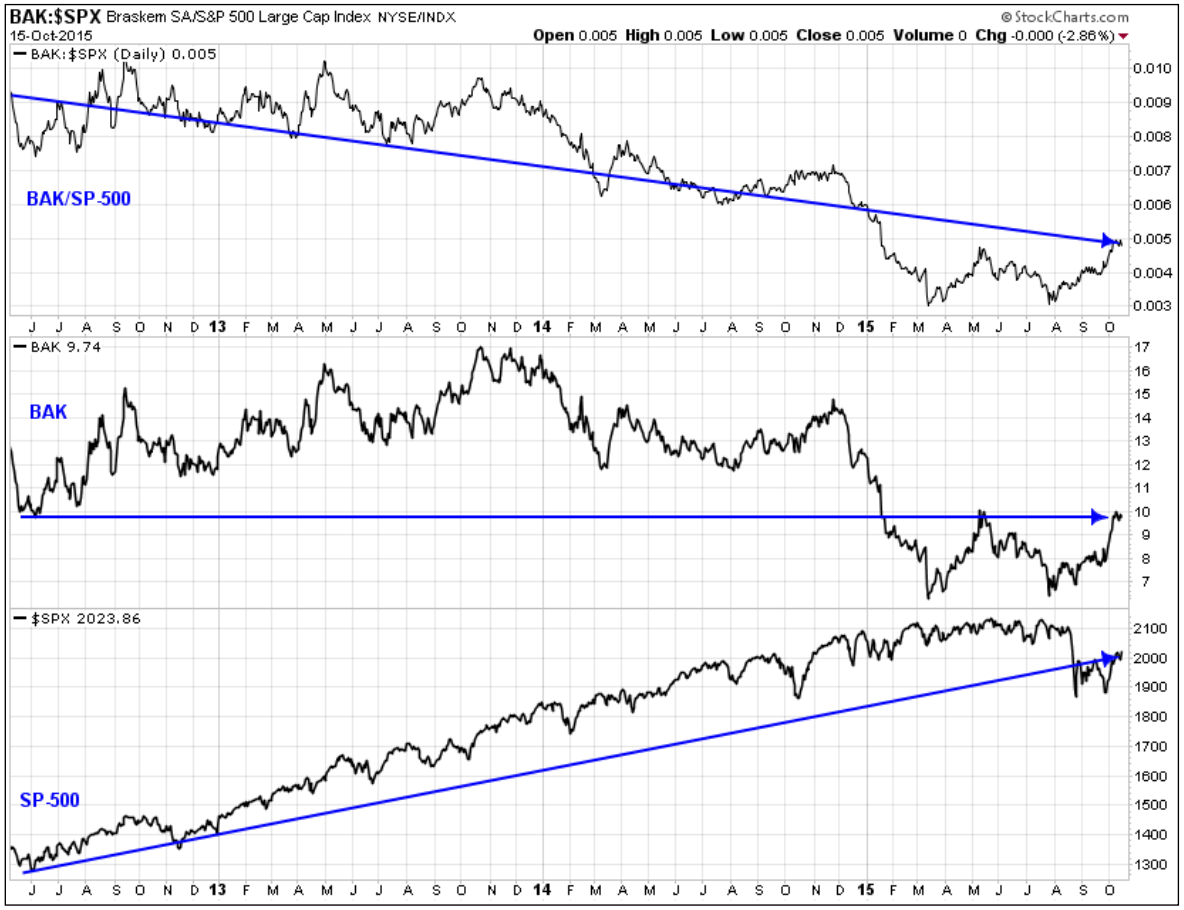
4C. When you explain in detail how your department manages these funds, you mention that in the morning investment committee all fund managers use a brainstorming process to decide the main action for the rest of the day. However, you warn your trainees that this kind of groups, in order to be an efficient device must meet three relevant conditions. Could you name, at least, two of these three conditions? (14 points)

For a statistical group to be a useful device, three conditions must be met. If these conditions are broken the group's advantage is quickly lost. This is a particular cause for concern from a behavioral point of view:

- People must be unaffected by others' decisions (effectively their errors must be uncorrelated).
- The probability of being correct must be independent of the probability of everyone else being correct.
- The participants must be unaffected by their own vote possibly being decisive.

5A. Taking the information contained in Figure 2-5 and the relative strength theory, what would have been the result of a long position in BAK during this period (June 2012 to October 2015)? (7 points)

As the upper window is a relative strength line and this line is going down while the denominator is going up, the numerator must remain unchanged or experience a down movement. The relative strength ratio drops by an approximate 45% (from 0.009 to 0.005), while the SP-500 index rises by an approximate 48% (from 1350 to 2000). Therefore, the time series of the stock (BAK) must remain constant in all this period, so a long position would have reported no benefit.



Source: StockCharts.com. Figure 2-12

5B. Taking the information contained in Figure 2-5, determine a clear trading signal that has just been triggered in the stock time series according to traditional charting methods. (8 points)

In the line chart of Bank of America price has broken up the intermediate high point of a double bottom. Therefore, a clear buy signal has been triggered.

Source: StockCharts.com. Figure 2-13

5C. You are analyzing Bank of America and you are interested in a security which performs as a return enhancer and not as a risk reducer. Taking the information contained in Table 2-3 determine in which fund will you include this stock. (7 points)

As Alpha and Beta are long-only hedge funds, their returns can be compared to the returns of our individual security (BAK). As we are interested in a return enhancer, we are looking for the highest correlation coefficient. Therefore, we include BAK into hedge fund Alpha.

5D. If one of your clients is interested in taking a position in two of your hedge funds, which combination is better in order to reduce the risk of the portfolio? Take the information contained in Table 2-3. (8 points)

The better combination is taking a position in hedge funds Alpha and Gamma because the correlation coefficient is lower than the rest of the combinations.

5E. Taking the information illustrated in Figure 2-6, determine the systematic risk of Bank of America and interpret this result. (6 points)

As we can see in this figure, the beta coefficient (systematic risk) equals 2.03, and this means that Bank of America monthly returns are considerably more aggressive or sensitive than those of the S&P-500 index.

5F. Taking the information illustrated in Figure 2-6, determine how well data fit into this statistical regression line. (4 points)

In this figure we can also see that the coefficient of determination is 36.94%. The coefficient of determination (R^2) is a number that indicates how well data fit a statistical model – sometimes simply a line or a curve. The low level of the R^2 indicates the regression line poorly explains the data.

6A. In a meeting with the head of the quantitative trading department of your company, you are asked about what types of objective functions did you use in order to optimize and classify the different tests. ¿Could you give the three test functions defined by Perry Kaufman to create a robust trading strategy? (12 points)

There are a number of steps that must be carefully performed before testing can begin. First, define the *test objective*. What results should the test present so that you can determine its success? Is it the highest profits possible from the test strategy, the frequency of profitable trades or reliability, or the average profit-to-average loss ratio? Maximum profit is most often the default criteria. Here are possible test functions:

- Test function 1 = (Total Profits)(1 – Maximum DrawDown).
- Test function 2 = (Total Gross Profits)/(Total Gross Losses) or Profit Factor.
- Test function 3 = (Annualized Returns)/(Annualized standard deviation of returns).

6B. Once you show these results to the head of the quantitative trading department, you realize that you forgot to include the Sharpe ratio. Could you determine this relevant ratio for all three strategies? (11 points)

$$\text{Sharpe Ratio} = \frac{\mu - r_{Rf}}{\sigma_{\mu}}$$

where

- μ = the expected return (the annualized rate of return)
- r_{RF} = the risk free rate (usually the 3-month rate)
- σ_{μ} = the standard deviation of the periodic returns

$$\text{Sharpe Ratio}_{\text{River}} = \frac{\mu - r_{Rf}}{\sigma_{\mu}} = \frac{16.7\% - 2\%}{19.7\%} = 0.75$$

$$\text{Sharpe Ratio}_{\text{Glacier}} = \frac{\mu - r_{Rf}}{\sigma_{\mu}} = \frac{6.2\% - 2\%}{11.6\%} = 0.36$$

$$\text{Sharpe Ratio}_{\text{Ocean}} = \frac{\mu - r_{Rf}}{\sigma_{\mu}} = \frac{5.3\% - 2\%}{13.9\%} = 0.23$$

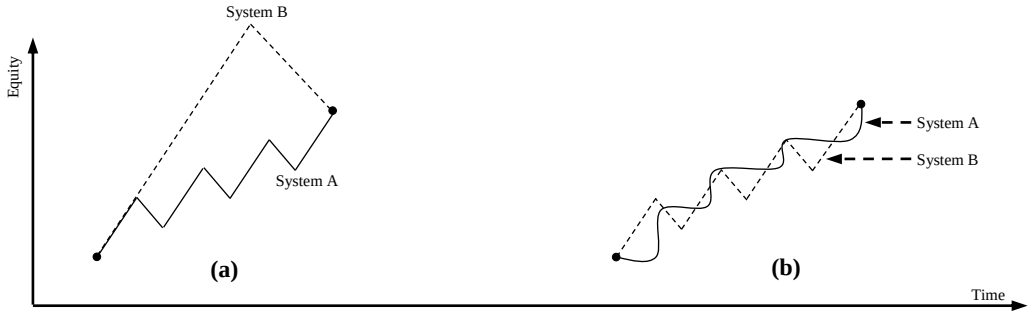
According to this return-to-risk ratio, the best trading strategy is *River*.

6C. When the head of the head of the quantitative trading department ask you why you did not include the Sharpe ratio in your backtest, you tell him that Sharpe ratio has two severe problems when applied to trading strategies backtests. Could you illustrate both drawbacks? (13 points)

The Sharpe Ratio satisfies the first universal criterion of system selection, that all else being equal, higher profits are better. However, it suffers from the following two drawbacks, illustrated in the following figures: (a) and (b), because it cannot distinguish between:

- Consecutive small losses (system B) and alternating small losses (system A).
- Consecutive small losses (system B) and large surges of profits (system A).

Clearly, system A is best in both cases.



7A. Is the name Ben gave for A correct? Answer "yes" or "no." If you answer "no," provide the correct pattern name. Also explain whether the short-term price action that followed the highlighted pattern matches the standard forecast for the pattern based on its correct name. (4 points).

- NO (1pt).
- The correct name is an upward gapping Tasuki (1pt).
- YES, this is a continuation pattern and thus the security did perform in line over the short-term with the standard forecast of this pattern (1pt).

Notes to Studiers: While it may look like a piercing line (as the second candle pierces more than 50% into the proceeding one) piercing lines are reversal patterns. An upward gapping Tasuki is established by an upward window (or gap). Then, a white candle is followed by a black candle which closes below the white candle but doesn't close the gap. The pattern is confirmed when the market advances upward.

7B. Is the name Ben gave for B correct? Answer "yes" or "no." If you answer "no," provide the correct pattern name. Also explain whether the short-term price action that followed the highlighted pattern matches the standard forecast for the pattern based on its correct name. (4 points).

- NO (1pt)
- The correct name is separating lines (1pt).
- YES, this is a continuation pattern and thus the security did perform in-line over the short-term with the standard forecast of this pattern (1pt).

Notes to Studiers: Counter-attack lines are reversal patterns. While both a counterattack and a separating lines pattern have opposite colored candles, counterattack lines have the same close, and separating lines have the same open.

7C. Is the name Ben gave for C correct? Answer "yes" or "no." If you answer "no," provide the correct pattern name. Also explain whether the short-term price action that followed the highlighted pattern matches the standard forecast for the pattern based on its correct name. (4 points).

- NO (1pt)
- The correct name is an advance block (1pt).
- YES, this is a reversal pattern. In an advance block, the second and third candles show signs of weakening. Here, we see longer shadows at the tops, with successively smaller bodies, signifying the rally is running into trouble, and longs should protect themselves. (1pt)

Notes to Studiers: A three-white-soldiers pattern is a sign of bullish strength especially if it occurs near a low price point, with white consecutive candles showing higher highs. The key is each candle should close at or near its high point.

7D. An analyst in your company is ready to place a buy recommendation on the security shown in Figure 2-8, with the recommendation that it be accumulated beginning at the open of the next day's trading session. Explain the evidence you see on this chart that would suggest this decision may not reflect the best timing. (8 points).

- The most recent pattern (though unconfirmed) is a dark cloud cover (1pt).
- The standard interpretation of a dark cloud cover pattern = a bearish reversal pattern. The fact that this candle penetrated more than 50% into the territory of the prior day's candle increases its significance (1pt).
- Williams %R is a momentum indicator which uses an inverted scaled when compared to other indicators like Stochastics or RSI. Thus, since Williams is now trending up (moving away from extreme overbought), this could be a sign of potential weakness in the most recent bullish move. (2 pts)
- The upper Bollinger Band was penetrated in the prior day's candle, but the dark cloud cover has now closed under the band. While some may see upward breaks of the bands as a sign of bullishness (that the uptrend will continue), this chart's history shows that upward breaks of the Bollinger Band have resulted in a reversion to the mean (a reversal) (1 pt.).
- Prior resistance is evident on 3 separate occasions (in late May, mid-July, & early August) at approximately $53 to $53.50. This is near where the most recent candle opened (1 pt.).
- Volume on the most recent candle (a selling candle) has increased vs the prior day, showing that there is more energy behind the potential for a reversal (more significance). Other answers may point to a slight downtrend in volume as the most recent uptrend continued, suggestive of weakening momentum. (1 pt.)

7E. Your portfolio manager wants an e-mail from you with an explanation of your analysis for Figure 2-9. Write the body of that e-mail in ten sentences or less and include the following information: name and implication of the most recent candlestick pattern; explanation of the weight of evidence from the chart including any other indications besides candlestick patterns; name and discuss the implication of 3 prior multiple-bar candle patterns that support your conclusion. (7 points).

- The most recent pattern is high-wave candle(s). A candidate can indicate there were 2 or 3 consecutive occurrences of high-wave candles, or simply mention the last one for full credit. (1 pt.)
- A high-wave candle has very long upper and lower shadows and a small real body. When occurring in a trending market, it may suggest that the market is losing its directional bias that it had before (trend is weakening) (1 pt.).
- Other significant candle patterns: (3 total points)
  - Rising Three Methods (late November): This is a bullish continuation pattern, comprised of 5 candles. However, it was not confirmed. The market reversed to the downside.
  - Harami (early October). The small body occurs within the range of the previous body. Note: a harami is still valid if its shadows extend above or below the prior day's full range. The fact that this pattern occurred after an extended downtrend increased its strength as a reversal pattern.
  - Tweezers Top (there are two occurrences…mid-September and late October). When occurring after an uptrend, this pattern is often a suggestion that the recent move is losing momentum, failing to recognize a new high.
  - Doji occurring in the middle of a move have no significance…there are several doji evident in the chart. However, no credit can be given for naming one that occurs in the middle of a move, where the move continues its direction.
- Market call/conclusion: There are three acceptable conclusions, but they must be supported in light of other evidence in the chart (2 total points). The defense of these conclusions MUST include

references beyond candlestick patterns for credit, such as prior resistance becoming support, and also the trend of volume. Here are some sample responses:

- The stock will reverse: "I'm bullish on this security. The high wave candles are suggesting a weakening of the downtrend, old resistance may be becoming a new support level, and the fact that there is declining volume on the recent price decline is more suggestive of a reversal to the upside. "
- The stock will continue to decline: "I'm bearish on this security. Old resistance is being broken, which should have been a new support level. A lower high was put in the over the past 3 months, along with declining volume on the last upward swing, followed by an upthrust where the bulls failed to sustain a new high."
- The stock will hold (try to find support): "We need to wait and see if the stock holds here at prior resistance…which could become a new support level. Currently the stock is in a downtrend but given the high-wave candles, and the fact volume isn't increasing as the stock declines, this trend could be slowing/weakening. Thus, we need to wait for confirmation before engaging in any new trades. We also don't have a pricing axis, so it is difficult to determine the best point of entry/stops, etc."

7F. What is your short-term recommendation for the security in Figure 2-10? Discuss more than one multi-bar candlestick pattern (name, approximate date, and implication) that supports your conclusion. In your analysis, include your interpretation of the provided technical indicators: Parabolic SAR, 20-day Exponential Moving Average (EMA), and Relative Strength Index (RSI). (7 points).

- Short-term recommendation = buy (1 pt.). This is the only acceptable answer, as there is not an abundance of other evidence to suggest a reversal to the downside.
- PSAR is a stop and reverse indicator. The small dot (most recent) is now beneath the price action, which indicates that the upward acceleration of the stock is bullish. (1 pt.)
- RSI is trending up, moving away from the oversold reading, showing a strengthening upward momentum (1 pt.)
- The EMA has been broken to the upside, after a gap up and with the presence of a larger white candle body…showing strength. The EMA has acted as resistance in looking at the chart's history…prior breaks above it have seen a change in trend (to the upside) (1 pt.).

Prior Multiple-Bar Patterns (need at least 2 different patterns): 3 total points - to get full credit for each pattern, candidate must name and discuss interpretation of the patterns. If they only name two patterns correctly, only one point total is awarded. They must share their interpretation of at least 2 patterns to get the remaining 2 pts credit). There are several possibilities, but these candles can't simply be randomly named…the chosen candles must support the bullish conclusion. Some of these include:

- Counterattack lines (late June). The long white candle closed where the prior long black candle closed…since occurring at a bottom of a downtrend, this increased its significance as a bullish reversal pattern.
- Frying Pan Bottom (mid Aug to mid Sept). Similar to a Western saucer bottom, began with a gap down and ended with a gap up. It also occurred at a prior support level from late June.
- Bullish Engulfing (early Oct). The long white candle not only engulfs the preceding candle, but it also closes the gap. It is confirmed after the two additional white candles.

7G. Based on your answer to the previous question, describe how you would setup a trade based on that information: (6 points)

If you described a long entry in the previous question, then assume an entry at $74.21. Specify the proper stop-loss price based on the most recent PSAR pattern – also calculate the number of shares that should be purchased, if the position needs to have no more than $20000 at risk when it stopped out (assuming you are able to get out of the position at your stop price).

If you described a short entry in the previous question, then assume an entry at $73.25. Specify the proper stop-loss price based on the most recent candle pattern–again, also calculate the number of shares that should be purchased, if the position needs to have no more than $20000 at risk when it stopped out (assuming you are able to get out of the position at your stop price).

- PSAR can be used to help establish a trailing stop price and is recalculated daily based on the price action/acceleration factor. The most recent trailing stop (based on the most recent small dot beneath latest price action) is: $71.51. Note, this PSAR level is also near prior levels of support during the frying pan bottom formation in August (approximately at $72). (2 pts)
- For a $20,000 max loss, this means the trader could purchase 7380 shares at an entry price of $74.21. (MATH = 74.21 – 71.51 = $2.70 risk per share….20000 / 2.70 = 7380 shares) (3 points)
- NOTE: if the candidate suggests a short entry and buy to cover (using a prior PSAR level) then 0 points will be awarded for the entire question.